

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

---

**~~IMAGES ARE BEST AVAILABLE COPY.~~**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

3 an inlet nozzle having a first diameter adapted to receive a carrier fluid, and  
4 configured to maintain a first pressure and a first temperature;  
5 a throat region, having a first and second end, connected to said inlet nozzle at  
6 said first end, said throat region having a second diameter less than said first  
7 diameter and adapted to receive said carrier fluid from said inlet nozzle, said  
8 throat region configured to maintain a second pressure and a second  
9 temperature, and having at least a first aperture adjacent to said first and second  
10 ends for injecting a first chemical vapor deposition fluid into said throat region  
11 to allow for atomization of said first chemical vapor deposition fluid by said  
12 carrier fluid and mixing of said atomized first chemical vapor deposition fluid  
13 with said carrier fluid; and,  
14 an exit nozzle, connected to said throat region at said second end, having a third  
15 diameter greater than said second diameter to allow for a substantial decrease  
16 in exit pressure, configured to maintain said exit pressure and a third  
17 temperature for said atomized first chemical vapor deposition fluid and said  
18 carrier fluid, and configured to introduce said atomized chemical vapor  
19 deposition fluid and said carrier fluid in the chemical vapor deposition  
20 chamber.

1 2. (Twice Amended) The apparatus of claim 1 wherein said inlet nozzle having  
2 said first diameter is adapted to receive and funnel said carrier fluid to said throat

3 region having second diameter, said inlet nozzle narrowing at an angle in the range of  
4 forty to sixty degrees.

1 4. (Twice Amended) The apparatus of claim 1 wherein said second pressure and  
2 said second temperature are selected to present a condition for atomization of said first  
3 chemical vapor deposition fluid.

1 5. (Twice Amended) The apparatus of claim 1 wherein said first chemical vapor  
2 deposition fluid comprises a precursor.

1 6. (Twice Amended) The apparatus of claim 1 wherein said throat region further  
2 comprises at least a second aperture, adjacent to said first and second ends, for  
3 injecting a second chemical vapor deposition fluid into said throat region to allow for  
4 atomization of said second chemical vapor deposition fluid by said carrier fluid, and  
5 allow for mixing of said atomized first and second chemical vapor deposition fluids  
6 with said carrier fluid.

1 7. (Twice Amended) The apparatus of claim 1 wherein said throat region is  
2 configured to maintain said first pressure to be greater than said third pressure to  
3 enhance atomization of said chemical vapor deposition fluid.

1 8. (Twice Amended) The apparatus of claim 1 wherein said throat region is  
2 adapted such that said second pressure is lower than said first pressure allowing for  
3 said first chemical vapor deposition fluid to be injected into said throat region.

1 9. (Twice Amended) The apparatus of claim 1 wherein said inlet nozzle is adapted  
2 to receive said carrier fluid at a constant flow rate ensuring said second pressure being  
3 maintained constant through said throat region.

1 10. (Twice Amended) The apparatus of claim 6 wherein said first and second  
2 chemical vapor deposition fluids are introduced simultaneously into said throat region  
3 without pre-mixing.

1 12. (Twice Amended) The apparatus of claim 1 wherein said exit nozzle expands  
2 to said third diameter from said throat region second diameter at an angle in the range  
3 of twenty to forty degrees.

1 13. (Twice Amended) An apparatus for delivering a plurality of chemical vapor  
2 deposition fluids to a chemical vapor deposition chamber comprising:  
3 an inlet nozzle having a first diameter adapted to receive a carrier fluid, and  
4 configured to maintain a first pressure and a first temperature;  
5 a throat region, having a first and second end, connected to said inlet nozzle at  
6 said first end, said throat region having a second diameter less than said first

7 diameter, and adapted to receive said carrier fluid from said inlet nozzle, said  
8 throat region configured to maintain a second pressure and a second  
9 temperature and having at least a first aperture adjacent to said first and second  
10 ends for injecting a first chemical vapor deposition fluid into said throat region  
11 to allow for atomization of said first chemical vapor deposition fluid by said  
12 carrier fluid and mixing of said atomized first chemical vapor deposition fluid  
13 with said carrier fluid; and,  
14 an exit nozzle, connected to said throat region at said second end, having said  
15 second diameter, said exit nozzle configured to maintain said second pressure  
16 and said second temperature, such that said exit nozzle is an extension of said  
17 throat region having the same dimensions as said throat region, said exit region  
18 configured to introduce said atomized first chemical vapor deposition fluid and  
19 said carrier fluid in said chemical vapor deposition chamber.

1 14. (Twice Amended) The apparatus of claim 13 wherein said inlet nozzle having  
2 said first diameter is adapted to receive and funnel said carrier fluid to said throat  
3 region having said second diameter, said inlet nozzle narrowing at an angle in the  
4 range of forty to sixty degrees.

1 15. The apparatus of claim 13 wherein said throat region is configured to operate at  
2 a critical Mach number of 1.0.

1 16. (Twice Amended) The apparatus of claim 13 wherein said second pressure and  
2 said second temperature are selected to present a condition for atomization of said first  
3 chemical vapor deposition fluid.

1 17. (Twice Amended) The apparatus of claim 13 wherein said first chemical vapor  
2 deposition fluid comprises a precursor.

1 18. (Twice Amended) The apparatus of claim 13 wherein said throat region further  
2 comprises at least a second aperture, adjacent to said first and second ends, for  
3 injecting a second chemical vapor deposition fluid into said throat region to allow for  
4 atomization of said second chemical vapor deposition fluid by said carrier fluid, and  
5 allow for mixing of said atomized first and second chemical vapor deposition fluids  
6 with said carrier fluid.

1 19. (Twice Amended) The apparatus of claim 13 wherein said throat region, having  
2 said second diameter, is adapted such that said second pressure is lower than said first  
3 pressure allowing for said first chemical vapor deposition fluid to be injected into said  
4 throat region.

1 20. (Twice Amended) The apparatus of claim 13 wherein said inlet nozzle is  
2 adapted to receive said carrier fluid at a constant flow rate ensuring said second  
3 pressure being maintained constant through said throat region.

21. (Twice Amended) The apparatus of claim 18 wherein said first and second chemical vapor deposition fluids are introduced simultaneously into said throat region without pre-mixing.

Please add new claims 22-25 as follows:

1 22. (New) The apparatus of claim 1 wherein said first chemical vapor deposition  
2 fluid comprises a dopant.

1 23. (New) The apparatus of claim 13 wherein said first chemical vapor deposition  
2 fluid comprises a dopant.

1 24. (New) The apparatus of claim 6 wherein said throat region further comprises at  
2 least a third aperture for injecting a third chemical vapor deposition fluid into said  
3 throat region to allow for atomization of said third chemical vapor deposition fluid by  
4 said carrier fluid, and allow for mixing of said atomized first, second and third chemical  
5 vapor deposition fluids with said carrier fluid.

1 25. (New) The apparatus of claim 18 wherein said throat region further comprises at  
2 least a third aperture for injecting a third chemical vapor deposition fluid into said  
3 throat region to allow for atomization of said third chemical vapor deposition fluid by

8

- 4 said carrier fluid, and allow for mixing of said atomized first, second and third chemical
- 5 vapor deposition fluids with said carrier fluid.



**Please replace the paragraph beginning at page 10, line 27 with the following paragraph:**

Fig. 6 is a diagram of an alternate embodiment of the cross-flow injector with the expansion nozzle, i.e., exit nozzle 42, eliminated. Exit end 51 depicts the alternate design, having substantially the same diameter as that of the throat 44,  $D_2$ . In particular, Fig. 6 shows that in this embodiment the injector cavity includes an inlet nozzle 50 and a throat region 44. The inlet nozzle 50 is tapered to meet the smaller diameter of the throat region 44, and the throat region 44 extends to and becomes the exit nozzle portion, i.e., exit end 51, so that this exit nozzle portion maintains the same diameter as the throat region.